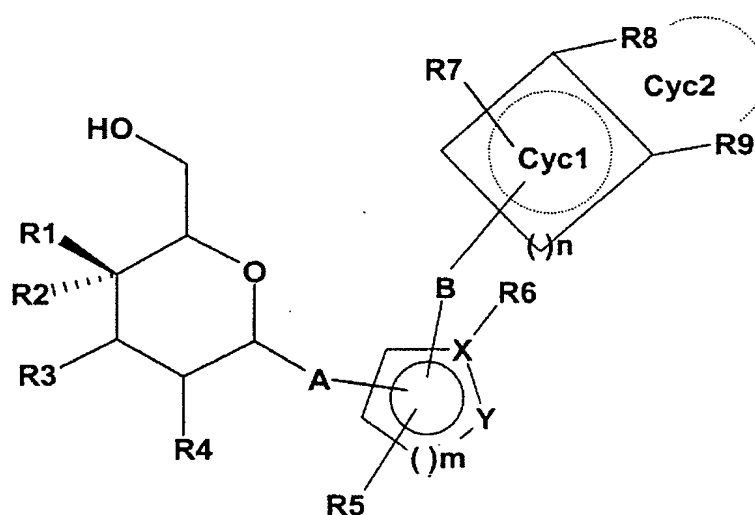


We claim:

1. A compound of formula I



40 wherein

R1 and

R2

are each independently F or H or one of said radicals R1 and R2 may be OH;

R3

is OH or F, with the proviso that at least one of the radicals R1, R2 and R3 must be F;

R4

is OH;

A

is O, NH, CH₂, S or a bond;

X

is C, O, S or N, with the proviso that X is C when Y is O or S;

Y

is N, O or S;

m is 1 or 2;

5 R5 is hydrogen, F, Cl, Br, I, OH, CF₃, NO₂, CN, COOH, CO(C₁-C₆)-alkyl, COO(C₁-C₆)-alkyl, CONH₂, CONH(C₁-C₆)-alkyl, CON[(C₁-C₆)-alkyl]₂, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl, (C₁-C₆)-alkoxy, HO-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl-O-(C₁-C₆)-alkyl, phenyl, benzyl, (C₁-C₆)-alkoxycarboxyl, wherein said CO(C₁-C₆)-alkyl, COO(C₁-C₆)-alkyl, 10 CONH(C₁-C₆)-alkyl, CON[(C₁-C₆)-alkyl]₂, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl, (C₁-C₆)-alkoxy, HO-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl-O-(C₁-C₆)-alkyl and (C₁-C₆)-alkoxycarboxyl radicals are optionally substituted with one or more fluorine atoms, 15 SO₂-NH₂, SO₂NH(C₁-C₆)-alkyl, SO₂N[(C₁-C₆)-alkyl]₂, S-(C₁-C₆)-alkyl, S-(CH₂)_o-phenyl, SO-(C₁-C₆)-alkyl, SO-(CH₂)_o-phenyl, SO₂-(C₁-C₆)-alkyl, SO₂-(CH₂)_o-phenyl, wherein said SO₂NH(C₁-C₆)-alkyl, SO₂N[(C₁-C₆)-alkyl]₂, S-(C₁-C₆)-alkyl, SO-(C₁-C₆)-alkyl and 20 SO₂-(C₁-C₆)-alkyl radicals are optionally substituted with one or more fluorine atoms, and wherein the phenyl ring of said S-(CH₂)_o-phenyl, SO-(CH₂)_o-phenyl and SO₂-(CH₂)_o-phenyl radicals is optionally mono- or disubstituted with F, Cl, Br, OH, CF₃, NO₂, CN, OCF₃, 25 O-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl or NH₂, and wherein o is 0, 1, 2, 3, 4, 5, or 6, NH₂, NH-(C₁-C₆)-alkyl, N((C₁-C₆)-alkyl)₂, NH(C₁-C₇)-acyl, phenyl or O-(CH₂)_o-phenyl, wherein the phenyl ring of said phenyl and 30 O-(CH₂)_o-phenyl radicals is optionally mono-, di-, or trisubstituted with F, Cl, Br, I, OH, CF₃, NO₂, CN, OCF₃, O-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl, NH₂, NH(C₁-C₆)-alkyl, N((C₁-C₆)-alkyl)₂, SO₂-CH₃, COOH, COO-(C₁-C₆)-alkyl or CONH₂, and wherein o is as hereinabove defined; 35

or, when Y is S, R5 and R6 taken together with the carbon atoms to which they are attached may form a phenyl ring;

- R6 is H, (C₁-C₆)-alkyl, (C₁-C₆)-alkenyl, (C₃-C₆)-cycloalkyl, or phenyl wherein said phenyl radical is optionally substituted with halogen or (C₁-C₄)-alkyl;
- 5 B is (C₀-C₁₅)-alkanediyl, wherein one or more of the carbon atoms in said alkanediyl radical may be replaced, independently of one another, with -O-, -(C=O)-, -CH=CH-, -C≡C-, -S-, -CH(OH)-, -CHF-, -CF₂-, -(S=O)-, -(SO₂)-, -N((C₁-C₆)-alkyl)-, -N((C₁-C₆)-alkyl-phenyl)- or -NH-;
- 10 n is 0, 1, 2, 3 or 4;
- Cyc1 is a 3-, 4-, 5-, 6- or 7-membered saturated, partially saturated or unsaturated ring, wherein one carbon atom of said ring may be replaced by O, N or S;
- 15 R7, R8, and R9 are each independently hydrogen, F, Cl, Br, I, OH, CF₃, NO₂, CN, COOH, COO(C₁-C₆)-alkyl, CO(C₁-C₄)-alkyl, CONH₂, CONH(C₁-C₆)-alkyl, CON[(C₁-C₆)-alkyl]₂, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl, (C₁-C₈)-alkoxy, HO-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl-O-(C₁-C₆)-alkyl, wherein said COO(C₁-C₆)-alkyl, CO(C₁-C₄)-alkyl, CONH(C₁-C₆)-alkyl, CON[(C₁-C₆)-alkyl]₂, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl, (C₁-C₈)-alkoxy, HO-(C₁-C₆)-alkyl and (C₁-C₆)-alkyl-O-(C₁-C₆)-alkyl radicals are optionally substituted with one or more fluorine atoms,
- 20 SO₂-NH₂, SO₂NH(C₁-C₆)-alkyl, SO₂N[(C₁-C₆)-alkyl]₂, S-(C₁-C₆)-alkyl, S-(CH₂)_o-phenyl, SCF₃, SO-(C₁-C₆)-alkyl, SO-(CH₂)_o-phenyl, SO₂-(C₁-C₆)-alkyl, SO₂-(CH₂)_o-phenyl, wherein said SO₂NH(C₁-C₆)-alkyl, SO₂N[(C₁-C₆)-alkyl]₂, S-(C₁-C₆)-alkyl, SO-(C₁-C₆)-alkyl and SO₂-(C₁-C₆)-alkyl radicals are optionally substituted with one or more fluorine atoms, and wherein the phenyl ring of said S-(CH₂)_o-phenyl, SO-(CH₂)_o-phenyl and SO₂-(CH₂)_o-phenyl radicals is optionally mono- or disubstituted with F, Cl, Br, OH, CF₃, NO₂, CN, OCF₃, O-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl or NH₂, and wherein o is
- 25
- 30
- 35

as hereinabove defined,

NH₂, NH-(C₁-C₆)-alkyl, N((C₁-C₆)-alkyl)₂, NH(C₁-C₇)-acyl, phenyl or O-(CH₂)_o-phenyl,

wherein the phenyl ring of said phenyl and O-(CH₂)_o-phenyl radicals is optionally mono-, di-, or trisubstituted with F, Cl, Br, I, OH, CF₃, NO₂, CN, OCF₃, (C₁-C₈)-alkoxy, (C₁-C₆)-alkyl, NH₂, NH(C₁-C₆)-alkyl, N((C₁-C₆)-alkyl)₂, SO₂-CH₃, COOH, COO-(C₁-C₆)-alkyl or CONH₂, and wherein o is as hereinabove defined;

or R₈ and R₉ taken together with the carbon atoms to which they are attached form a 5-, 6- or 7- membered, saturated, partially saturated or completely unsaturated ring herein referred to as Cyc₂,

wherein one or two carbon atom(s) in said Cyc₂ ring are optionally replaced by N, O or S, and wherein said Cyc₂ ring is optionally substituted with (C₁-C₆)-alkyl, (C₂-C₅)-alkenyl or (C₂-C₅)-alkynyl,

wherein said (C₁-C₆)-alkyl, (C₂-C₅)-alkenyl and (C₂-C₅)-alkynyl radicals are optionally substituted with F, Cl, OH, CF₃, NO₂, CN, COO(C₁-C₄)-alkyl, CONH₂, CONH(C₁-C₄)-alkyl or OCF₃,

and wherein a -CH₂- group contained in said (C₁-C₆)-alkyl, (C₂-C₅)-alkenyl and (C₂-C₅)-alkynyl radicals is optionally replaced by -O-;

and pharmaceutically acceptable salts thereof.

2. The compound of Claim 1 wherein:

R₁ and R₂ are each independently F or H or one of said radicals R₁ and R₂ may be OH, with the proviso that at least one of said radicals R₁ and R₂ is F;

R₃ is OH;

R₄ is OH;

- A is O or NH;
- X is C, O or N, with the proviso that X is C when Y is S;
- 5 Y is N or S;
- m is 1 or 2;
- 10 R5 is hydrogen, F, Cl, Br, I, OH, CF₃, NO₂, CN, COOH, CO(C₁-C₆)-alkyl, COO(C₁-C₆)-alkyl, CONH₂, CONH(C₁-C₆)-alkyl, CON[(C₁-C₆)-alkyl]₂, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl, (C₁-C₆)-alkoxy, HO-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl-O-(C₁-C₆)-alkyl, phenyl, benzyl or (C₁-C₆)-alkoxycarboxyl,
- 15 wherein said CO(C₁-C₆)-alkyl, COO(C₁-C₆)-alkyl, CONH(C₁-C₆)-alkyl, CON[(C₁-C₆)-alkyl]₂, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl, (C₁-C₆)-alkoxy, HO-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl-O-(C₁-C₆)-alkyl, (C₁-C₆)-alkoxycarboxyl and SO-(C₁-C₆)-alkyl radicals are
- 20 optionally substituted with one or more fluorine atoms,
- or when Y is S, R5 and R6 taken together with the carbon atoms to which they are attached may form a phenyl ring;
- 25 R6 is H, (C₁-C₆)-alkyl, (C₁-C₆)-alkenyl, (C₃-C₆)-cycloalkyl, or phenyl wherein said phenyl radical is optionally substituted with halogen or (C₁-C₄)-alkyl;
- 30 B is (C₀-C₁₅)-alkanediyl, wherein one or more of the carbon atoms in said alkanediyl radical may be replaced, independently of one another, with -O-, -(C=O)-, -CH=CH-, -C≡C-, -S-, -CH(OH)-, -CHF-, -CF₂-, -(S=O)-, -(SO₂)-, -N((C₁-C₆)-alkyl)-, -N((C₁-C₆)-alkyl-phenyl)- or -NH-;
- 35 n is 0, 1, 2, 3 or 4;
- Cyc1 is a 3-, 4-, 5-, 6- or 7-membered saturated, partially saturated or unsaturated ring, wherein one carbon atom of said ring may be replaced by O or S;

R7, R8, and R9 are each independently hydrogen, F, Cl, Br, I, OH, CF₃, NO₂, CN, COOH, COO(C₁-C₆)-alkyl, CO(C₁-C₄)-alkyl, CONH₂, CONH(C₁-C₆)-alkyl, CON[(C₁-C₆)-alkyl]₂, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl, (C₁-C₈)-alkoxy, HO-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl-O-(C₁-C₆)-alkyl, S-(C₁-C₆)-alkyl, CF₃ or SO-(C₁-C₆)-alkyl,

wherein said COO(C₁-C₆)-alkyl, CO(C₁-C₄)-alkyl, CONH(C₁-C₆)-alkyl, CON[(C₁-C₆)-alkyl]₂, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl, (C₁-C₈)-alkoxy, HO-(C₁-C₆)-alkyl, (C₁-C₆)-alkyl-O-(C₁-C₆)-alkyl, S-(C₁-C₆)-alkyl and SO-(C₁-C₆)-alkyl radicals are optionally substituted with one or more fluorine atoms,

or R8 and R9 taken together with the carbon atoms to which they are attached form a 5-, 6- or 7- membered, saturated, partially saturated or completely unsaturated ring herein referred to as Cyc2,

wherein one or two carbon atom(s) in said Cyc2 ring is optionally replaced by N, O or S, and wherein said Cyc2 ring is optionally substituted with (C₁-C₆)-alkyl, (C₂-C₅)-alkenyl or (C₂-C₅)-alkynyl,

wherein said (C₁-C₆)-alkyl, (C₂-C₅)-alkenyl and (C₂-C₅)-alkynyl radicals are optionally substituted with F, Cl, OH, CF₃, NO₂, CN, COO(C₁-C₄)-alkyl, CONH₂, CONH(C₁-C₄)-alkyl or OCF₃,

and wherein a -CH₂- group contained in said (C₁-C₆)-alkyl, (C₂-C₅)-alkenyl and (C₂-C₅)-alkynyl radicals is optionally replaced by -O-.

3. The compound of Claim 1 wherein the sugar residues are beta(β)-linked and the stereochemistry in the 2, 3 and 5 position of the sugar residue has the D-glucos configuration.

4. The compound of Claim 1 wherein:

R1 and R2 are each independently F or H or one of said radicals R1 and

R2 may be OH,
with the proviso that at least one of said radicals R1 and R2 is
F;

- 5 R3 is OH;
- R4 is OH;
- A is O;
- 10 X is C, O or N, with the proviso that X is C when Y is S;
- Y is N or S;
- 15 m is 1;
- R5 is hydrogen, F, Cl, CF₃, OCF₃, COO(C₁-C₄)-alkyl, (C₁-C₅)-
alkyl, (C₂-C₄)-alkenyl, (C₂-C₄)-alkynyl, (C₁-C₄)-alkoxy, HO-
20 (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O-(C₁-C₄)-alkyl, phenyl, benzyl,
(C₁-C₄)-alkoxycarboxyl, OCH₂CF₃ or (C₁-C₄)-alkyl-CF₂-,

or when Y is S, R5 and R6 taken together with the carbon
atoms to which they are attached may form a phenyl ring;
- 25 R6 is H, (C₁-C₆)-alkyl, (C₁-C₆)-alkenyl, (C₃-C₆)-cycloalkyl, or phenyl
wherein said phenyl radical is optionally substituted with
halogen or (C₁-C₄)-alkyl;
- B is (C₁-C₄)-alkanediyl, wherein one carbon atom in said
30 alkanediyl radical may be replaced with -O-, -(C=O)-,
-CH(OH)-, -CHF-, -CF₂-, -CO-NH-;
- n is 2 or 3;
- 35 Cyc1 is an unsaturated 5- or 6-membered ring, wherein one
carbon atom of said ring may be replaced by O or S;

R7, R8, and R9 are each independently hydrogen, F, Cl, Br, I, OH, (C₁-C₄)-
alkyl, OCH₂CF₃, (C₁-C₈)-alkoxy, HO-(C₁-C₆)-alkyl, (C₁-C₄)-

alkyl-O-(C₁-C₄)-alkyl, S-(C₁-C₄)-alkyl, SCF₃ or OCF₃,

or R₈ and R₉ taken together form the radicals –C=CH-O-,
 -CH=CH-S- or –CH=CH-CH=CH- and, with the carbon atoms to
 which they are attached, form an unsaturated or partially
 saturated 5- or 6-membered ring, said ring being optionally
 substituted by (C₁-C₄)-alkoxy or –O-(CH₂)_p-O- wherein p is 1 or
 2.

5. The compound of Claim 1 wherein:

R₁ and R₂ are each independently F or H,
 with the proviso that at least one of said radicals R₁ and R₂ is
 F;

R₃ is OH;

R₄ is OH;

A is O;

X is C and Y is S, or
 is O and Y is N, or
 is N and Y is N;

m is 1;

R₅ is hydrogen, CF₃, (C₁-C₆)-alkyl, or when Y is S, R₅ and R₆
 taken together with the carbon atoms to which they are
 attached may form a phenyl ring,

R₆ is H, (C₁-C₄)-alkyl or phenyl;

B is –CH₂–, –C₂H₄–, –C₃H₆–, –CO-NH-CH₂– or –CO-CH₂-CH₂–;

n is 2 or 3;

Cyc1 is an unsaturated 5- or 6-membered ring, wherein one carbon atom of
 said ring may be replaced by S;

R7, R8, and R9 are each independently hydrogen, F, Cl, Br, I, (C₁-C₆)-alkyl, (C₁-C₄)-alkoxy, S-(C₁-C₄)-alkyl, SCF₃ or OCF₃,

5 or R8 and R9 taken together form the radicals –C=CH-O- or –CH=CH-CH=CH- and, with the carbon atoms to which they are attached, form an unsaturated or partially saturated 5- or 6-membered ring, said ring being optionally substituted by (C₁-C₄)-alkoxy.

10

6. The compound of Claim 1 wherein:

15 R1 and R2 are each independently F or H, with the proviso that at least one of said radicals R1 and R2 is F;

R3 is OH;

20 R4 is OH;

A is O;

25 X is C and Y is S, or is N and Y is N;

m is 1;

30 R5 is hydrogen, CF₃, (C₁-C₆)-alkyl, or when Y is S, R5 and R6 taken together with the carbon atoms to which they are attached may form a phenyl ring,

R6 is H or (C₁-C₄)-alkyl;

35 B is –CH₂- or –CO-NH-CH₂-;

n is 2 or 3;

Cyc1 is phenyl or thiophene;

R7, R8, and R9 are each independently hydrogen or Cl,

5 or R8 and R9 taken together with the carbon atoms to which
 they are attached, form a furan ring or a phenyl ring optionally
 substituted with methoxy.

7. A pharmaceutical composition comprising a compound of Claim 1 and
 a pharmaceutically acceptable carrier.
- 10 8. A pharmaceutical composition comprising a compound of Claim 1 and
 one or more blood glucose-lowering active ingredients.
- 15 9. A method of treating type 1 or type 2 diabetes which comprises
 administering to a patient in need thereof a therapeutically effective
 amount of a compound of Claim 1.
- 20 10. A method of lowering blood glucose which comprises administering to
 a patient in need thereof a therapeutically effective amount of a
 compound of Claim 1.
- 25 11. A method of treating type 1 or type 2 diabetes which comprises
 administering to a patient in need thereof a therapeutically effective
 amount of a compound of Claim 1 with at least one other blood
 glucose-lowering active ingredient.
- 30 12. A method of lowering blood glucose which comprises administering to
 a patient in need thereof a therapeutically effective amount of a
 compound of Claim 1 with at least one other blood glucose-lowering
 active ingredient.